REMARKS

By this amendment, all pending claims have been canceled and new claims 33-36 are submitted to place this application in condition for allowance. The cancellation of the claims moots the restriction requirement. In addition, the objections to "high aluminum containing" and "slight compression strain" are moot since this language is no longer present in the new claims.

Turning to the prior art rejection, the Examiner continues to insist that a *prima facie* case of obviousness has been established by Ellmers. This position is basically predicated on the fact that Ellmers discloses the MOVPE process and the use of a temperature range of 590 to 625 °C. With this disclosure, the Examiner contends that this temperature overlaps that set forth in the claims and therefore a *prima facie* case of obviousness exists. To date, the Examiner is also implying that insufficient evidence is of record to demonstrate that any unexpected results occur when the method of claim 33 is practiced.

Claim 33 is new with respect to Ellmers as well as to previously-cited Bohling since neither of these prior art references disclose MOVPE within a temperature range of 300°C to 590°C. Ellmers only discloses a temperature range of 590°C to 625°C while Bohling is performing MOVPE at 700°C. Also, Ellmers, if anything, suggests to the one skilled in the art that it would be beneficial to use higher temperatures, not lower ones as specified in claim 33. This teaching away coupled with the unexpected improvements associated with the invention when MOVPE is practiced in the claimed temperature range demonstrates the patentability of claim 33.

Applicant submits that any allegation of obviousness is effectively rebutted by the evidence submitted herewith. This evidence, as will be more full explained below, demonstrates that employing the claimed temperature range of 300-590 °C by MOVPE and the use of tertiarybutylarsine (t-C4H9AsH2) and tertiarybutylphosphine (t-C4H9PH2, TBP) to achieve the strain compensating layer(s) that is compressively or tensilely strained produces improvements that are not in the least expected given the teachings of Ellmers.

The claimed deposition temperature, i.e., 300-590 °C, may touch on the lower limit of Ellmers. However, the question still remains whether one of skill in the art would find it obvious to employ the claimed lower range and what happens when MOVPE is practiced at such a range. It is also important to note that Ellmers only exemplifies a temperature of 625 °C for MOVPE and does not show any example wherein a temperature of 590 °C is employed. Applicants submit that while Ellmers may have disclosed an effective range of temperature for the MOVPE process, there is absolutely no recognition in Ellmers of what happens when the MOVPE is practiced in the claimed temperature range and in accordance with the other limitations of claim 33, i.e., wherein the strain compensating layer(s) are achieved and compressively or tensilely strained by MOVPE at a temperature in the range of 300°C to 590°C by use of tertiarybutylarsine (t-C4H9AsH2) and tertiarybutylphosphine (t-C4H9PH2, TBP). This, in fact, is the invention and the discovery of improvements when the method of claim 33 is practiced and this invention is not obvious based on Ellmers. The publications and testing discussed below clearly demonstrate that the lower temperature range in concert with the improved decomposition characteristics of the applied chemicals TBA

and TBP is crucial for the effective usage of these chemicals in the MOVPE deposition process and in particular for the extension of the achievable wavelength range of the strain-compensated (GaIn)As/Ga(PAs) VECSEL layer structure.

It is important to understand that, in MOVPE growth for highly strained (GaIn)As quantum well structures for deposition temperatures in excess of 600°C, a strain-related surface roughening process of the compressively strained (GaIn)As-quantum well layer is observed. This phenomena clearly deteriorates the structural as well as the opto-electronic properties of these VECSEL layer structures. In addition, the crucial strain compensation by applying tensile-strained Ga(PAs)-barrier layers is hindered if not made impossible by applying the standard hydride precursors (AsH3 and PH3) instead of TBA and TBP for deposition temperatures below 600°C.

The favourable properties of the MOVPE-process, applying TBA and TBP at deposition temperatures below 600°C, becomes specifically apparent, i.e. in the very recent, first time realization of high-quality VECSEL-structures using the above mentioned material system for emission wavelengths exceeding 1160nm.

The specific advantages of the MOVPE-deposition at temperatures below 600°C are verified especially in 2 recent publications of the inventors (Li Fan et al., Appl. Phys. Lett. 91, 131114 (2007) (#1); M. Fallahi et al., IEEE Photon. Technol. Lett. Vol. 20, No. 20, 1700 (2008) (#2), which are submitted herewith. These publications as well as those listed below are identified by number for ease of identification. The advantage of the low temperature MOVPE processing is seen on page 1700 of publication #2, the second column, last paragraph to lines 1-6 of the first column of page 1701. The use of the low temperatures and TBA and TBP promotes higher values of strain and higher

indium concentrations in the active QW as well as growing of GaAsP barriers with precise chemical composition to balance the QW strain.

The same very advantage of performing MOVPE at temperatures between 300°C and 590°C can be seen also by the following additional publications, which were published by the inventors in several US-Journals from 2005 to 2007 and are also attached herewith:

- Diehl et al, Appl. Phys. Lett. 91, 071103 (2007) (#3)
- Fan et al. IEEE Photonics Technology Letters, Vol. 19, No. 8, April , 15, 2007 (#4)
- Fan et al. Optics Letters, Vol. 31, No. 24, December 15, 2006 (#5)
- Kaneda et al., IEEE Photonics Technology Letters, Vol. 18, No. 17, September 1, 2006 (#6)
- Fan et al., Appl. Phys. Lett. 88, 251117 (2006) (#7)
- Fan et al., Appl. Phys. Lett. 88, 021105 (2006) (#8)
- Fan et al. Appl. Phys. Lett., 86, 211116 (2005) (#9)
- Fan et al., IEEE Photonics Technology Letters, Vol. 17, No. 9, September 2005 (#10)

The very advantage of the manufactured VECSEL can be seen from the cited publications above. In particular, the produced VECSEL is able to produce a yellow laserbeam by intracavity frequency doubling. Yellow lasers, especially high-power lasers according to the invention, are of great interest for a wide range of applications from quantum computers to medical applications. Neither VECSEL according to Ellmers nor structures according Bohling provide a suitable semiconductor-structure covering

the 570- to 590-nm band in a very effective way. This is only achieved, if the MOVPE according to the invention is performed at low temperatures between 300°C and 590°C, e.g. by 575°C, as shown by the enclosed protocol. This finding is a clear rebuttal of any allegation of obviousness based on Ellmers. That is, one of skill in the art would not expect to have produced the yellow laserbeam that the inventors have been able to produce by practicing the method of the Ellmers.

To further support the rebuttal of the allegation of obviousness, attached herewith is a printout of a protocol of the inventors, which documents the performance of the claimed method on March 3, 2009 in the laboratory of the inventors. The performed method and the VECSEL achieved by this experiment are identical to the method and VECSEL of all the cited publications above and does therefore show all the advantageous characteristics described therein.

The protocol shows the following: It is a screenshot of the MOVPE-machine showing on the vertical axis the temperature and on the horizontal axis the time of the epitaxy-procedure. The active part of the VECSEL-structure is gained in the part indicated by RPG (resonant periodic gain) which was performed from 10:05 am to 11:25 on March 3, 2009 at 575°C. Growth of the strain-compensating Ga(Pas)-barrier-layers is indicated by bold blue lines, which are found at the lowermost part of the horizontal axis over the RPG section. This protocol is a reaffirmation of the improvements explained in the attached publications and demonstrates or proves the production of the claimed semiconductor-layer-structure by MOVPE at temperatures below 600°C, particularly in a range between 300°C to 590°C.

To summarize, even if Applicants agree that the Examiner has established a *prima facie* case of obviousness against claim 33 by the touching of the 590 degree temperature in the range of Ellmers with the range of claim 33, the results associated with the invention are a clear rebuttal of the allegation of obviousness. The invention produces unexpected improvements in the ability to make a yellow laserbeam via the claimed process of producing a semiconductor layer structure that comprises at least one strain-compensating layer for surrounding layer(s) of a semiconductor device, whereby the strain-compensating layer(s) are semiconductor-layers strained by tensile stress and wherein the layer succession features one or several layers with arsenic and/or phosphorus by use of TBA sources and/or TBP sources, wherein the strain compensating layer(s) are achieved and compressively or tensilely strained by MOVPE at a temperature in the range of 300°C to 590°C by use of tertiarybutylarsine (t-C4H9AsH2) and tertiarybutylphosphine (t-C4H9PH2, TBP).

In summary, any *prima facie* case of obviousness based on Ellmers is effectively rebutted by the evidence submitted herewith in the form of numerous publications by the inventors and the actual testwork showing the unexpected improvements associated with the inventive method and particularly practicing the MOVPE process in the claimed temperature range. Based on this evidence, the *prima facie* case of anticipation or obviousness against new claim 33 is overcome and this claim along with its dependent claims are now in condition for allowance.

Accordingly, the Examiner is requested to examine this application in light of this amendment and pass all pending claims onto issuance.

If the Examiner believes that an interview would be helpful in expediting the

allowance of this application, the Examiner is requested to telephone the undersigned at 202-835-1753.

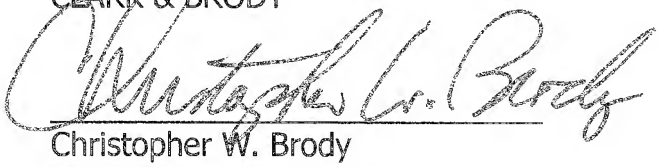
The above constitutes a complete response to all issues raised in the Office Action dated April 14, 2009.

Again, reconsideration and allowance of this application is respectfully requested.

Applicants petition for a three month extension of time. Please charge deposit account 50-1088 the amount of $555.00.

Please charge any fee deficiencies to Deposit Account No. 50-1088.

Respectfully submitted,
CLARK & BRODY



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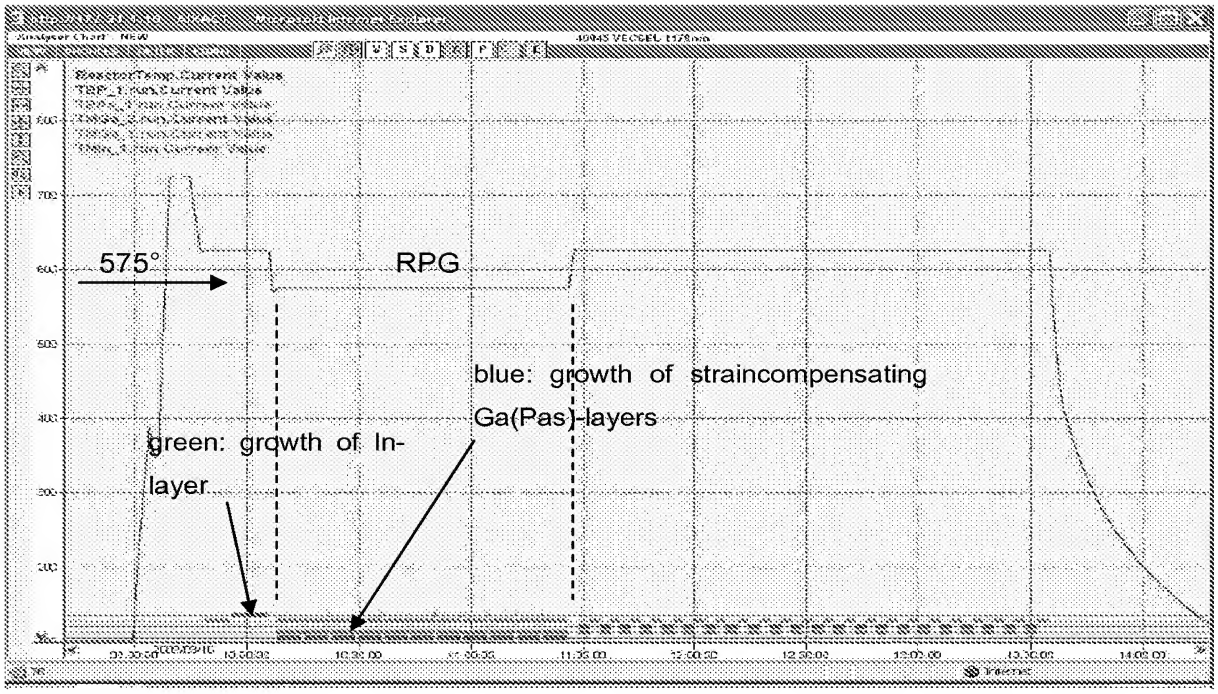
Date: October 14, 2009

- ATTACHMENTS


575°
RPG
blue: growth of straincompensating Ga(Pas)-layers
green: growth of In-layer